PATENT COOPERATION TREATY

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To:

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NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL PRELIMINARY EXAMINATION REPORT
(PCT Rule 71.1)

Date of mailing *(day/month/year)*	07.07.2004
Applicant's or agent's file reference	**IMPORTANT NOTIFICATION**
M/44212-PCT	

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/EP 03/07542	11.07.2003	12.07.2002

Applicant
DE NORA ELETTRODI S.P.A. et al.

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.

2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.

3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

4. **REMINDER**

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

The applicant's attention is drawn to Article 33(5), which provides that the criteria of novelty, inventive step and industrial applicability described in Article 33(2) to (4) merely serve the purposes of international preliminary examination and that "any Contracting State may apply additional or different criteria for the purposes of deciding whether, in that State, the claimed inventions is patentable or not" (see also Article 27(5)). Such additional criteria may relate, for example, to exemptions from patentability, requirements for enabling disclosure, clarity and support for the claims.

Name and mailing address of the international preliminary examining authority:	Authorized Officer
European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Louca, M Tel. +49 89 2399-8104

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference M/44212-PCT	**FOR FURTHER ACTION**	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/EP 03/07542	International filing date *(day/month/year)* 11.07.2003	Priority date *(day/month/year)* 12.07.2002
International Patent Classification (IPC) or both national classification and IPC C25B9/08		
Applicant DE NORA ELETTRODI S.P.A. et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 6 sheets, including this cover sheet.

   ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of 3 sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the opinion
   - II ☐ Priority
   - III ☒ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
   - VI ☐ Certain documents cited
   - VII ☐ Certain defects in the international application
   - VIII ☐ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
11.02.2004	07.07.2004 ✓
Name and mailing address of the international preliminary examining authority: European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized Officer Mauger, J Telephone No. +49 89 2399-8447

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/EP 03/07542

I. Basis of the report

1. With regard to the **elements** of the international application *(Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17))*:

Description, Pages

1-14 as originally filed

Claims, Numbers

1-20 received on 25.06.2004 with letter of 25.06.2004

Drawings, Sheets

1/6-6/6 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

   These elements were available or furnished to this Authority in the following language: , which is:

   ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).

   ☐ the language of publication of the international application (under Rule 48.3(b)).

   ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

   ☐ contained in the international application in written form.

   ☐ filed together with the international application in computer readable form.

   ☐ furnished subsequently to this Authority in written form.

   ☐ furnished subsequently to this Authority in computer readable form.

   ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

   ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

   ☐ the description, pages:

   ☐ the claims, Nos.:

   ☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

   (Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

III. Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

1. The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non-obvious), or to be industrially applicable have not been examined in respect of:

   ☐ the entire international application,

   ☒ claims Nos. 20

   because:

   ☐ the said international application, or the said claims Nos. relate to the following subject matter which does not require an international preliminary examination (specify):

   ☒ the description, claims or drawings *(indicate particular elements below)* or said claims Nos. 20 are so unclear that no meaningful opinion could be formed *(specify)*:

   see separate sheet

   ☐ the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed.

   ☒ no international search report has been established for the said claims Nos. 20

2. A meaningful international preliminary examination cannot be carried out due to the failure of the nucleotide and/or amino acid sequence listing to comply with the standard provided for in Annex C of the Administrative Instructions:

   ☐ the written form has not been furnished or does not comply with the Standard.

   ☐ the computer readable form has not been furnished or does not comply with the Standard.

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-19
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-19
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-19
	No:	Claims	

2. Citations and explanations

see separate sheet

Re Item III

Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

1) Claim 20 defines a cathodic finger "substantially as hereinbefore described". With respect to such a claim it is impossible to determine which combination of technical features the claim intendeds to protect. Thus the claim is vague and unclear (Article 6 PCT). No opinion can be issued for such claims.

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1) Reference is made to the following documents:

D1: WO 00 06798 A (ELTECH SYSTEMS CORP) 10 February 2000 (2000-02-10) cited in the application
D2: DE 23 53 583 A (SOLVAY) 9 May 1974 (1974-05-09)

2) Document D1 discloses a finger-type cathodic structure for a chlor-alkali electrolysis cell. The structure consists of a finger-shaped mesh structure coated with a diaphragm and an internal support plate which is corrugated and connected to the mesh at the apex of the corrugations. This plate provides mechanical support and an electrical connection A corrugated sheet is a sheet provided with projections (see page 6, line 30 to page 11, line 4; claim 18 and figures 3 and 4).

2.1) Document D2 discloses a finger-type cathodic for a chlor-alkali electrolysis cell. The structures consist of a finger-shaped mesh structure coated with a diaphragm and an internal support plate which has ribs attached to it and is connected to the mesh at the apex of the ribs. The plate also contain an aperture. This plate provides mechanical support and an electrical connection. The ribs are projections (see page 3, line 6 to page 7, line 22; claims and figures 1 and 2).

2.2) The subject-matter of claims 1-19 defines novel subject-matter since neither document D1 nor document D2 discloses the use of caps of a particular shape as the projection structures (Article 33(2) PCT).

3) The subject-matter of claims 1-19 is considered to imply an inventive step (Article

33(3) PCT).

The problem addressed by these claims is to provide a cathodic finger structure which is mechanically stable, provides a good electrical connection and hinders gas an liquid flows as little as possible.

The caps defined in claims 1-19 provide an excellent mechanical stability and electrical contact unlike the ribs in document D2. Furthermore they allow a free circulation of gas and liquid unlike the corrugations of document D1.
The use of such caps is not suggested in the prior art and thus an inventive step can be recognised for these claims.

CLAIMS

1. A cathodic finger structure for diaphragm electrolytic cell, comprising a hollow body defining an internal volume in fluid communication with a perimetrical chamber and delimited by a conductive surface provided with holes coated with a chemically inert porous diaphragm, said hollow body housing a reinforcing and electric current distributing internal element constituted by at least one sheet provided with projections, characterised in that said projections have a shape equivalent to spherical caps or elliptic caps or caps with prismatic sections.

2. The finger structure of claim 1, characterised in that the conductive surface provided with holes is an interwoven wire mesh or a perforated sheet.

3. The finger structure of anyone of claims 1 or 2 characterised in that said at least one sheet is a single sheet provided with projections on both its major surfaces.

4. The finger structure according to anyone of claims 1 to 3, characterised in that said sheet provided with projections is secured to said conductive surface by means of an electrically conductive connection.

5. The finger structure of claim 4, characterised in that said conductive connection is located on the apex of at least part of said projections.

6. The finger structure of anyone of claims 4 or 5, characterised in that said conductive connection establishes a plurality of generally equivalent ohmic paths for the uniform distribution of electric current.

7. The finger structure of anyone of claims 1 to 6, characterised in that said projections are arranged according to a square mesh pattern.

8. The finger structure of anyone of claims 1 to 6, characterised in that said projections are arranged according to a quincuncial pattern.

9. The finger structure of anyone of the preceding claims, characterised in that each vertical section of said at least one sheet comprises part of at least one of said projections.

10. The finger structure of anyone of claims 1 to 9, characterised in that the distance between the centres of two adjacent caps is comprised between 50 and 65 millimetres and the radii of extrados and intrados of said caps are comprised between 17 and 22 millimetres and between 12 and 16 millimetres respectively.

11. The finger structure of anyone of the preceding claims, characterised in that the thickness of said sheet is comprised between 5 and 7 millimetres.

12. The finger structure of anyone of the preceding claims, characterised in that said internal volume defined by said hollow body is subdivided by said at least one sheet into two portions in fluid communication with said perimetrical chamber, and said portions are only partially occupied by said projections and are available for the natural internal recirculation of electrolytes.

13. The finger structure of anyone of the preceding claims, characterised in that said al least one sheet provided with projections is further provided with openings in the residual flat areas.

14. The finger structure of anyone of the preceding claims, characterised in that said projections are obtained by plastic deformation of said at least one sheet.

15. The finger of claims 1 to 13, characterised in that said projections are independent pieces secured onto said at least one sheet.

16. The finger according to claim 15, characterised in that said projections are secured onto said at least one sheet by welding or brazing.

17. An electrolysis cell comprising an anodic compartment and a cathodic compartment separated by an inert porous diaphragm, wherein said cathodic compartment consists of a perimetrical chamber provided with at least one nozzle in the bottom for discharging electrolytes and with at least one nozzle in the top for gas outlet, and of a plurality of cathodic fingers according to anyone of the preceding claims electrically connected to said perimetrical chamber.

18. A process of chlor-alkali electrolysis, which comprises feeding a sodium chloride solution to the anodic compartment of the cell of claim 17, applying electric current and discharging a solution of caustic soda and depleted sodium chloride formed inside said internal volume of said plurality of cathodic fingers through said nozzle for discharging electrolytes and a hydrogen flow through said nozzle for gas outlet.

19. The process of claim18 characterised in that said hydrogen has free ascensional motion inside the internal volume of said plurality of cathodic fingers and free longitudinal motion towards said perimetrical chamber, and in that said solution of caustic soda and depleted sodium chloride has free recirculation in the internal volume of said plurality of cathodic fingers.

20. A cathodic finger for diaphragm electrolytic cell substantially as hereinbefore described with reference to the annexed figures.